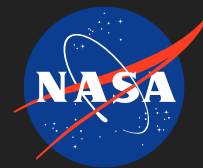


Modified Ionic Liquids for Thermal Properties in CubeSats, Phase I

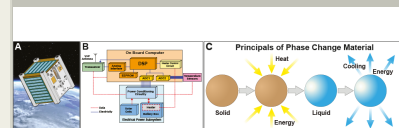
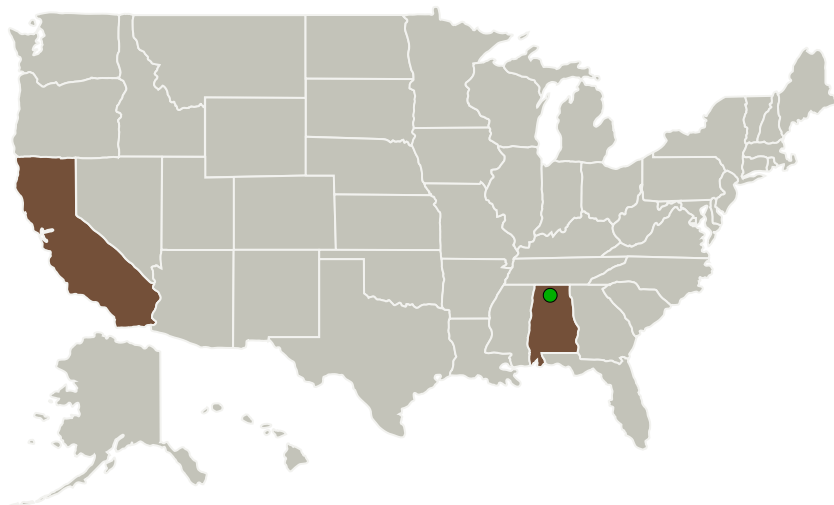


Completed Technology Project (2015 - 2015)

Project Introduction

NASA desires new phase change systems to regulate heat transfer among components within a CubeSat small spacecraft. The temperature variation within the small spacecraft often leads to large temperature spikes that may be detrimental to onboard unit components. Temperatures can often range from -40°C to $+80^{\circ}\text{C}$. InnoSense LLC (ISL) will develop an ionic liquid-based heat transfer fluid for use within the CubeSat. Our method will be to control the functional groups attached to an ionic liquid to tune the melting point and reduce electrical conductivity of the material. The proposed technology will be tailored for use with a variety of different components within the CubeSat. In Phase I, ISL proposes to synthesize a functionalized ionic liquid and test its thermal properties. The proposed material is expected to have high thermal conductivity, high heat storage density, and melting point with range of component operation. During Phase II and follow-on phases, the proposed technology will be refined, optimized, and scaled to larger size production. The proposed materials will also be tested in various environments. Packaging methods will be investigated and the final product will be integrated into working CubeSats with the assistance of a CubeSat design company.

Primary U.S. Work Locations and Key Partners



(A) The CubeSat often orbits in LEO. (B) The thermal control of the system can be regulated using heaters and sensors. (C) ISL's proposed ionic liquid-based phase change material will absorb heat when heated and emit heat as it cools. This phenomena will regulate temperature of the enclosed region.

Modified Ionic Liquids for Thermal Properties in CubeSats, Phase I

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Modified Ionic Liquids for Thermal Properties in CubeSats, Phase I



Completed Technology Project (2015 - 2015)

Organizations Performing Work	Role	Type	Location
Innosense, LLC	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB), Women-Owned Small Business (WOSB)	Torrance, California
● Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations

Alabama	California
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Project Transitions

**June 2015:** Project Start**December 2015:** Closed out**Closeout Summary:** Modified Ionic Liquids for Thermal Properties in CubeSats, Phase I Project Image**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/139249>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Innosense, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

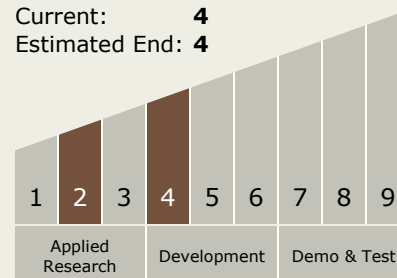
Carlos Torrez

Principal Investigator:

David Hess

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4

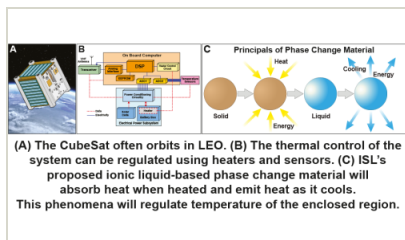


Modified Ionic Liquids for Thermal Properties in CubeSats, Phase I

Completed Technology Project (2015 - 2015)



Images



Briefing Chart Image

Modified Ionic Liquids for Thermal Properties in CubeSats, Phase I
(<https://techport.nasa.gov/image/136421>)

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.2 Heat Transport

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System